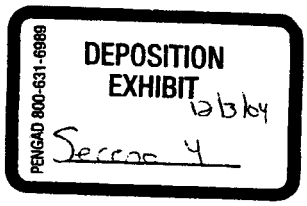
5, 15, 22



ATLAS INCIDENT 3/22/2002 INVESTIGATION NOTES

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Power was on, machine was stopped, paper was threaded through the machine, a roll was on the unwind, mechanical tests and measurements were being taken. The machine was setup to use only internal arms 2L and 2R.

Analysis:

The first electrical thing checked was the electrical connections for the 2L and 2R arms. The connecting plugs were in the correct positions, they were pushed all the way in, and the hold-down clips were in place. Control wiring was verified to be as per system schematics

In order to re-create the event, the first test done was to load a new 4.0" core of 60" length into the #2 arms. The arms were then lowered onto the internal winding drum. (There was no paper between the core and the rubber roll). When the JOG Pushbutton at the Rewind Internal Operator Side control station was pressed, the core in arms 2L and 2R accelerated, and the 2L and 2R arms did not lift the core off of the winding drum. The red STOP button at the Rewind Internal Operator Side control station did not stop the core from accelerating. Pressing the red mushroom head EMERGENCY STOP pushbutton at the Rewind Internal Operator Side control station caused the machine to stop immediately. Upon inspection it was observed that the core was only contacting the winding drum at the ends. The test was performed again with the core still down on the rubber roll. The same results were obtained. The arms were then raised, and the core un-chucked and chucked several times while the mechanical movement of the chucking mechanism and the movement of the arms were checked. The core was reloaded into 2R and 2L arms and lowered onto the internal winding drum. Pressing the JOG pushbutton at the Rewind Internal Operator Side control station, it was observed that the core slipped against the internal drum, accelerated to a slow speed, and then stopped accelerating and maintained a constant slow speed. It did not continue to accelerate. The operator's observation at this time was that the core turning at this speed was a normal situation and he could tape the paper to the core with no problem. This was tried several more times with the same results. This test was performed at speed set points from 2,000 FPM down to 200 FPM with no changes in the results from the first time the test was performed.

The next test was to actually simulate the events that occurred preceding the incident. First the machine was run without any paper in it. This allowed the electronic footage counter that is part of the slitter's control system to count up mock paper footage. The goal was to achieve a footage count of 26,500 feet and simulate the length of the last roll that was run on the machine. Once the footage was achieved, the machine was stopped. Once all the rolls had stopped, the JOG pushbutton at the Rewind Internal Operator Side control station was pressed. The core in 2L and 2R arms accelerated without stopping, and the 2L and 2R arms started to lift. Pushing the red STOP button at the Rewind Internal Operator Side control station did not stop these events from continuing. To stop

the core from turning and the arms from lifting, the red mushroom-head Emergency Stop pushbutton was pressed, which stopped all movement. This test was retried several more times with the same results. The same test was then tried, only with different machine speed set points ranging from 2,000 FPM to 200 FPM. The rewind arms 2R and 2L still accelerated and the arms started to lift.

The footage counter was reset to zero by lowering the internal rewind beam and unchucking the internal rewind arms using the UNCHUCK pushbutton located at the Rewind Internal Operator Side control station. The internal beam was brought back into running position, and the internal arms 2L and 2R were reloaded onto the internal winding drum. The JOG pushbutton at the Rewind Internal Operator Side control station was pressed, and it was observed that the core slipped against the internal drum, accelerated to a slow speed, and then stopped accelerating and maintained a constant slow speed. It did not continue to accelerate. This test was retried at speeds from 200 FPM to 2,000 FPM with the same results.

At this point, it was concluded that the logic controlling the torque signal to the Rewind Internal Arms 2L and 2R, and the logic controlling the air pressure settings for these same arms did not reset when the 26,500 foot roll was unloaded from the machine. Once the JOG pushbutton was pressed, the machine responded as if there was still a large roll in the internal arms 2L and 2R. In this case, the torque signal to the arm motors would be enough to maintain required tension at the radius of a roll this size, and the air pressures that control roll-to-internal winding drum contact would be in the lifting direction to compensate for the weight of a 26,500 foot roll.

Greg Hagopian and David Peavey

Investigation of Atlas accident involving Gerry Puccilo on 3/22/2002
Final report

A. Machine status information recorded by HI for Winding arms 2L&2R, which were in operation, these are center position #2 inboard.

B. Machine status information by HI check on machine computer screens immediately following accident with machine status untouched.

C. Discussion by HI with second operator Bill Dunne who was working with Gerry at time of accident.

D. Proma post incident electrical report G. Hagopian and D. Peavey.

E. Ron Purcell -Valmet Atlas engineer visits evaluation 3/25-3/29/2002.

F. Conclusion

A. Observations by H. Isherwood immediately following accident on the Atlas slitter

1. The winding arms #2 position were in the vertical position
2. The arm chucks were fully engaged in the chucked position. 2L chuck outside edge face to outside winder arm face measured 33/64 inches, 2R chuck outside edge faces to outside winder arm face measured 34/64 inches.
3. The locking tie bar was in use the teeth between the bar and the winding arm housing were engaged on both winding arms. The locking mechanism for the tie bar on 2R was locked; the locking device of the arm to the winding beam was loose (as appropriate at set up to align the winding arm positions to web). The locking mechanism for the tie bar on 2L was finger loose and tightened enough to prevent loss of tie bar constraint, the locking device of the arm to the winding beam was loose (as appropriate at set up to align the winding arm positions to web). This information would indicate that the core ejection during the incident was not a failure of arm restraint system.
4. The distance between the chuck faces measured 59 13/16 inches showing that in operation with the core measured at 60 inches slight compression of the core would have existed.
5. Dimension measurements of the core that was ejected were confirmed at 3 inch ID and 4 inch OD. Other cores for the slitting job in question were examined and found to conform to same dimensions. The weight of the core was 9Lbs.
6. The ejected core when examined at both ends showed marks associated with the chuck rubber band gripping mechanism in a position showing correct chucking action.
7. The core ID and the chuck OD were checked for fit and this was good.
8. The 2R&L chucks were in good condition with no looseness. Subsequent evaluation by the Jim McDonald a machinist and S.Lynch a mechanical engineer confirmed the chucks and the chuck locking mechanism were fully functional and in good condition.
9. The nip roller on the pacer roller was on, this allows the determination to be made from the amount of paper visible in the machine at the rewind arms being nominal that overspeed occurred only at the rewind arms not at the winding drums during the process of machine jog to align the web. This was further confirmed by the center slit in the web with the slitting knife backed off during the change over proving that there had been no significant winding drum movement.

B. Machine computer screen status

SET UP SCREEN

Setup display PDF 350
Setup Max speed 2900 Width 61
Thickness 129.5 micron Mill roll core 12

	Internal	External
Final length	26469	25356
Core size	3 inch	3 inch
Final diameter	47.6	46.7

Main Menu Screen

Machine speed 0 Desired speed 304 fpm PDF 350 Max speed 2001 fpm

		External	Internal
Length	Final	26469	25356
	Current	0	0
Diameter	Final	47,6	46,6
	Current	4	4
Unwind tension		2.399	Multiplier 120%
Unwind		54.5	Material thickness 129 micron

Setup arms

Atlas
PDF 350

3R	0	3L	2R	60"	2L	1R	0	1L
Trim 0.5 inches								
6L	0	6R	5L	0	5R	4L	0	4R
					Not used			
Material 60 inches				Mate run not used				

C. Account of incident by Bill Dunne to HI at just after the incident

1. Bill and Gerry had set up the machine.
2. Gerry was holding the paper which was over the top of the core (core may not have been visible to Gerry) and the winding arms were down with the core contacting the paper and pressing it to the winding drum. This was in preparation to complete set up by aligning the paper to the core and the winding arm positions.
3. The machine jog was initiated was by Bill and at this point the core in the winding arms accelerated, a high whine was heard (noted by other personnel in vicinity of machine Greg Unger, Tod Drew.) This indicated a major overspeed of the winding core. The winding drum behaved as normal.
   At this point in time Bill pressed line stop and saw Gerry moving backwards away from the winding arms with his arms going up to cover his face in a defensive position. It was during this period that the winding arms were moving out and the core was ejected from the machine hitting Gerry in the face. The incident occurred over a short period of time –seconds- as Bill noted –It happened so quickly.
   During the investigation tests we estimated time to full acceleration to be less than 5 seconds.

D. PROMA Technologies, Inc. Electrical report

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Report by Greg Hagopian and David Peavey

E. Valmet Atlas evaluation wrap up meeting notes

1. The speed limit control of 300rpm was not present on both of the #2 winding stations. The Infranor PWM Dc servo drive (armature feed back model) that is attached to the individual arm drive board had a latch position that was incorrectly set. When set in one position it gives armature voltage feedback and in the other position tachometer (speed feedback). Boards direct from the factory in our spares **some** were found to require the latch to be set in the armature voltage feed back position, they were then soldered into position and function verified.
2. Speed control boards for other arms were found to be incorrect.1L-wrong position, 2L – neither position, 4R- neither position, 5L- neither position.
3. Every drive board was tested and corrected independent of the computer verified would speed limit and latches soldered in position-10 drives in total. Note one drive latch was found soldered. Actual speed limit at maximum was measured and now applicable was 528 fpm for a 4" Outside diameter core versus maximum speed of 3000 fpm in no speed control status.
4. It was found that after jog condition had been terminated by line stop as part of original design the rewind arm remain activated for a time of 30 blocks*10 secs. This means that at zero line speed the rewind arm motors would rotate if not in firm contact with the winding drum or if the web is not attached to the core. Corrective action was to reduce time down to 5 seconds total. Note the new slitter is zero time set. It is to be confirmed that the 5 seconds can be reduced to zero by the OEM and when confirmed a timing change to be implemented.
5. The explanation why the rewind arms lifted off could not be determined or reproduced. The only possible reason postulated was that when the rewind arms went to uncontrolled speed that is maximum speed, the tremendous vibration could have affected the electrical transducer to pneumatic to (I to P) in the rewind arms. This could have changed the arm lower and lift air cylinder pressures and allowing the arms to raise. The other alternative is that the operator activated the arm raise switch-this is inconsistent with the operator statements. Note it is not unusual for arms to slightly lift at stop because down pressure is relieved at that time. Minor changes in I to P calibration and plant air pressure changes can exacerbate functionality causing slight lift.
6. On the possibility that the machine had not reset from the previous slitting job even though the computer screen showed it had, two checks were made. The first was to verify that a slit roll could be unchucked at the rewind arms unchuck station (local not control panel) by running less than 500 counts –approximately 1500 feet which was possible, thus demonstrating functionality. The machine was then made to a 26,000 feet slit roll status, as designed it could not be unchucked at local station. Unchucking at local

7. station would have voided machine-reset status. The second check to verify machine reset was to run machine without core or paper web to a status where the machine would believe it had 26,000 feet on the rewind. With the machine stopped the attempt to fit a core into the rewind arms and close the chucks failed. This again verified that the machine had reset from the previous slitting works order.
8. It was determined that of the two winding arms involved in the incident that one was in speed control the other not. Circumstances could apply that dependant upon the grab of the individual chucks and arm pressure to the drum either a stall or a run away situation could exist.
9. As a matter of diligence the new Valmet Atlas slitter installed 2001was tested for the same problem and all rewind arms were found to be working correctly

F. **Conclusion**

The primary cause of the accident was an uncontrolled over speed of one of the winding arm motors, this coupled with the arms lifting, differential torque of one arm motor to the other created a situation where the core was ejected at high speed from the winding arms. The cause of the uncontrolled over speed was incorrect setting of the latches on the Infranor PWM Dc servo drive. The knowledge of the criticality of this unit to Proma personnel was unknown or had been lost in the passage of time since the machine was installed.
A lesson to be learned, when run away occurs use E stop and vacate the area as quickly as possible.